FIVE ESTUARIES OFFSHORE WIND FARM

VOLUME 9, REPORT 13: MARGATE AND LONG SANDS SPECIAL AREA OF CONSERVATION – BENTHIC MITIGATION PLAN

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GLOSSARY OF TERMS

Term	Definition
Benthic ecology	Benthic ecology encompasses the study of the organisms living in and on the sea floor, the interactions between them and impacts on the surrounding environment
Design Envelope	A description of the range of possible elements that make up the Five Estuaries design options under consideration, as set out in detail in the project description. This envelope is used to define Five Estuaries for Environmental Impact Assessment (EIA) purposes when the exact engineering parameters are not yet known. This is also often referred to as the “Rochdale Envelope” approach.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for one or more Nationally Significant Infrastructure Projects (NSIP).
Effect	Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of the impact with the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria.
Environmental Impact Assessment (EIA)	A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of the EIA Directive and EIA Regulations, including the publication of an Environmental Statement.
Impact	An impact to the receiving environment is defined as any change to its baseline condition, either adverse or beneficial, resulting from the activities associated with the construction, operation and maintenance, or decommissioning of the project.
Intertidal	The area of the shoreline which is covered at high tide and uncovered at low tide.
Maximum design scenario (MDS)	The maximum design parameters of each asset (both on and offshore) considered to be a worst case for any given assessment.
Mitigation	Mitigation measures, or commitments, are commitments made by the project to reduce and/or eliminate the potential for significant effects to arise as a result of the project.
Scour and cable protection	In order to prevent seabed scour around foundation structures and cables, cable protection may be placed on the seabed to protect from current and wave action.
Subtidal	The region of shallow waters which are below the level of low tide.

DEFINITION OF ACRONYMS

Term	Definition
VE	Five Estuaries
NSIP	Nationally Significant Infrastructure Project
DCO	Development Consent Order
SAC	Special Area of Conservation
M&LS	Margate and Long Sands
MDS	Maximum Design Scenario
NE	Natural England
MCZ	Marine Conservation Zone
PEIR	Preliminary Environmental Information Report
UXO	Unexploded Ordnance
CBRA	Cable Burial Risk Assessment
HVDC	High Voltage Direct Current
ECC	Export Cable Corridor
AIS	Automatic Identification System
HVDC	High Voltage Directional Current
CSIP	Cable Specification and Installation Plan

1 INTRODUCTION

1.1 BACKGROUND

1.1.1 Five Estuaries Offshore Wind Farm Limited (the Applicant) has submitted an application to the Planning Inspectorate on behalf of the Secretary of State, for a Development Consent Order for the Five Estuaries Offshore Wind Farm (herein referred to as VE) under section 37 of the Planning Act 2008.

1.1.2 VE is the proposed extension to the operational Galloper Offshore Wind Farm located 37 km off the coast of Suffolk at its nearest point, comprising of both offshore and onshore infrastructure. The onshore connection works are located within the administrative area of Tendring District Council, within Essex County Council. VE will have an overall capacity of greater than 100 Megawatts (MW) and therefore constitutes a Nationally Significant Infrastructure Project (NSIP) under the Section 15 (3) of the Planning Act 2008.

1.1.3 This benthic mitigation plan has been produced to be submitted as part of the Development Consent Order (DCO) application.

1.2 PURPOSE OF DOCUMENT

1.2.1 The document sets out outline mitigation commitments to avoid and reduce impact from cable protection in the Margate and Long Sands Special Area of Conservation (M&LS SAC). These mitigation commitments have informed the Volume 5, Report 4: Report to Inform Appropriate Assessment.

1.3 STRUCTURE OF DOCUMENT

1.3.1 The following information is provided in this report:

- Review of mitigation options proposed by Natural England (NE);
- Characteristics of seabed in the Margate and Long Sands SAC and considerations to help achieve effective cable burial;
- Hierarchy and process of measures to ensure that cable protection measures are only used as a last resort if burial cannot be achieved;
- Summary of the assumed maximum footprint of cable protection (in the event that it is needed) and considerations that informed defining the maximum design scenario (MDS);
- Overview of potentially feasible cable protection options and process for determining the final cable protection design to minimise impacts on the Margate and Long Sands SAC;
- Cable protection mitigation commitments; and
- Ecological benefit of commitments.

2 REVIEW OF MITIGATION OPTIONS

2.1.1 The table below provides a review of mitigation options proposed by NE in July 2023.

Table 2.1 Review of mitigation options proposed by Natural England in July 2023

NE recommended mitigation	Suitability for VE
Avoid Designated Site – e.g., Hornsea Project 3 removed infrastructure from Markham's Triangle Marine Conservation Zone (MCZ)	VE are unable to avoid Margate and Long Sands (M&LS) SAC due to safety concerns raised by Harwich Haven Authority with regards to cable installation and presence in close proximity to pilot boarding activities.
Reduce number of export cables though use of HV/DC system or coordinated approach with other projects – e.g., Norfolk Projects	Number of export cables has been reduced from 4 to 2 following Preliminary Environmental Information Report (PEIR) feedback and therefore the footprint and impact to the benthic environment has been significantly reduced. HDVC technology is not appropriate for Five Estuaries due to the distance from shore (HVDC is typically used for much longer links) and supply chain constraints associated with securing HVDC cables and converter stations in the necessary timescales.
Cutting and removing sections of disused cables to avoid cable crossings – e.g., Norfolk Projects	Not relevant for VE – no disused cables to cross in M&LS SAC.
Micro siting cables around reef and other features of ecological importance – All projects post Lincs Offshore Wind Farm consent 2008	The feature of interest in this case is Annex I sandbank and it is not possible to completely avoid the feature due to the shipping and navigation constraints located directly to the north of the SAC. The route corridor is located in the northern tip of the M&LS SAC to reduce the footprint in the SAC as far as possible. VE will seek in pre-construction route engineering to minimise the cable length in the SAC through the detailed cable route design. This engineering design work will be informed by surveys to determine the location of features of potential archaeological interest, potential items of unexploded ordnance (UXO) and will inform cable burial risk assessment (CBRA).
Sandwave levelling to reduce risk of free spanning cables and requirement for external cable protection –All projects since 2016	Provision for sandwave levelling has been made in the assessment in order to aid effective cable burial. Whilst there are no sand waves in the area where the offshore export cable corridor (ECC) crosses M&LS SAC, there are megaripples and therefore sand wave levelling may be necessary. Sand wave levelling is performed specifically to help ensure the cable is laid on a consistent seabed which (a) helps to ensure the cable is not overstressed (and thus reduces further interventions as a result),

NE recommended mitigation	Suitability for VE
have included an element of this	and (b) gives a more consistent level from which to bury the pipe into the seabed. This in turn increases the likelihood that the required depth of lowering of the cable is achieved since it allows the burial system to operate more consistently by removing the peaks and troughs caused by the sand waves. This will help avoid the need for further cable protection measures in this area.
Adoption of the reburial hierarchy with external cable protection being last resort – all projects	The flow chart provided in Section 4 provides an overview of the proposed hierarchy regarding cable reburial. Prior to cable lay and burial operations commencing further surveys to develop the ground model will be completed. This will allow a good definition of the soils and seabed to be developed which in turn will allow the experienced cable lay contractor to select the most appropriate methodology for burial to maximise the confidence in achieving the required depth of lowering for the cable. This is the first and primary mitigator in avoiding external cable protection. If the required depth of lowering is not achieved, then first further passes will be attempted to try to improve the depth of lowering. If again this is not achieved a mass flow excavator or alternative tool could be employed to improve the depth or lowering, however, confidence must be high that the material on top of the cable will remain in place through the life of the cable.
Pre-consent – finalise cable burial risk assessment using Geotech. data to focus cable protection requirements to areas where cables are likely to be sub-optimally buried e.g., mixed sediment	The available environmental data for the area (such as the project specific geophysical data) gives a good degree of certainty that the ground conditions will be suitable for burial as set out in Section 3 and the Outline Cable Burial Risk Assessment (CBRA) (Volume 9, Report 9).
Use of guard vessels and/or advance mapping to avoid sub-optimally buried/surface laid cables negating the need for physical cable protection e.g., Lincs Offshore Wind Farm cable in the Wash	An Automatic Identification System (AIS) monitoring service is unlikely to be practically used to identify practical risks to the cable. The main protection risks from large ships will come from (a) vessels anchoring, which will only happen in emergency situations given the proximity to several traffic separation schemes or (b) through loss of cargo, e.g. a failed container. Neither of these aspects would be identified through AIS. For smaller vessels which present aspects such as over trawling risks then the issue is more challenging as their transponders may not always be active and nor are they always the strongest transmitters. This means a smart system would not even identify is a vessel is active in the area. In this location, which has

NE recommended mitigation	Suitability for VE
	extensive and route constrained shipping traffic, a guard vessel sitting on station or patrolling an exposed area of cable would add obstruction and risk to the shipping and navigation in the area.
Requirement to install cable protection with the minimal footprint e.g., pinning – TWT cable corridors work	The market is constantly developing, and RWE is a responsible developer which is continually striving for sustainable solutions. The market will be monitored and if a more suitable protection option is available at the time of installation (if required) then it will be considered. It is noted a small footprint option will likely add value both for the M&LS SAC and for end-of-life considerations for the site. The status of technology readiness is provided in Section 7.
No use of jack up barges along export cable routes through benthic SACs – e.g., Norfolk Offshore Wind Farm projects	Given the position of the M&LSC SAC avoidance of jack-up operations is desirable due to the high levels of shipping activity in the area. Currently it is only foreseen this may be required during pre-construction geotechnical surveys or in the event repair is needed, but even at this stage it will be avoided, if possible.
No cable protection in fisheries byelaw areas to avoid hindering reef recovery, noting that cable may still go through the outskirts of these areas – e.g., Norfolk Projects	VE Offshore ECC avoids the byelaw area.
Designing rock armouring to mirror the structure and function of geogenic reef – advised for Viking Link interconnector	No ecological merit as the feature of discussion is Annex I sandbank.
Detonation of UXO outside of designated sites to avoid the creation of a crater – suggested for Dudgeon and Sheringham Extension projects	Not appropriate due to shipping and navigation pressures.
Bundling of cables	Bundling has a number of disadvantages and is not seen as preferred for this application. The risk to both cables being

NE recommended mitigation	Suitability for VE
	damaged in any risk event is increased, and repair is more complex. Moreover, whilst High Voltage Directional Current (HVDC) cables have been installed as a bundled pair, the HVAC 220kV or 275kV cables likely to be used for VE are significantly heavier and not within the standard capabilities of installation vessels. It is likely installers will have significant concerns about installing these as a bundled pair particularly in deeper waters.

3 SEABED CHARACTERISTICS M&LS SAC

3.1 SEABED SEDIMENTS

3.1.1 The M&LS SAC covers an area of 649 km^2 and starts to the north of the Thanet coast of Kent and proceeds in a north-easterly direction to the outer reaches of the Thames Estuary. It contains a number of Annex I Sandbanks slightly covered by seawater at all times, the largest of which is Long Sands itself (Natural England, 2010). The sandbanks are composed of well-sorted sandy sediments, with muddier and more gravelly sediments in the troughs between banks, and the upper crests of some of the larger banks dry out at low tide. The banks are tidally influenced estuary mouth sandbanks, the southern banks are aligned approximately east-west in the direction of tidal currents entering the Thames Estuary from the English Channel whereas Long Sand is aligned in a northeast-southwest orientation with influence from the North Sea. In common with all sandbanks the structure of the banks is dynamic and there have been significant movements of the bank edges over time.

3.1.2 The fauna of the bank crests is characteristic of species-poor, mobile sand environments, and is dominated by polychaete worms and amphipods while more diverse communities of polychaetes, crustacea, molluscs and echinoderms are found in the troughs and on the bank slopes. Mobile epifauna includes crabs and brown shrimp, along with squid and commercially important fish species such as sole and herring.

3.1.3 While the primary reason for designation of this site is the presence of Sandbank Annex I interest features the reef-forming ross worm (*Sabellaria spinulosa*) is also present. However, distribution of *S. spinulosa* is patchy and aggregations form crusts rather than reefs. Consequently, this species is considered as secondary importance to the site and is not cited as a qualifying feature for SAC designation.

3.1.4 The Five Estuaries geophysical and benthic survey data illustrates that where the cable route crosses the M&LS SAC the seabed sediments comprise sand, sandy gravel and gravelly sand, with megaripples sitting over London clay and channel infill deposits. Generally the London Clay is close to surface with between 0 and 2 m of holocene sediments. The average depth of holocene sediments is expected to be less than 1 m.

3.2 SEDIMENT MOBILITY

3.2.1 The seabed survey data, other available data as outlined in the ES, Volume 6, Part 2, Chapter 2: Physical Processes, and the outline CBRA (Volume 9, Report 9) indicate that where the ECC crosses the M&LS SAC is outside of the key areas of sediment mobility along the offshore ECC, but there are megaripples present in the area which are likely to be affected by a degree of mobility. Therefore, it is possible that as well as boulder clearance, debris clearance and UXO clearance, pre-sweeping of mobile sediments may be required to create a suitable seabed surface to enable cable burial to be achieved and maintained. If required pre-sweeping is likely to be limited to the removal of the megaripple crests to remove any steep gradients caused by them. Should this be undertaken the material removed from ML&S SAC will be placed within the offshore ECC, within the M&LS SAC, to ensure that sediment remains in the same sediment cell and therefore no sediment is being removed from the local sediment transport system, only redistributed.

3.3 SUITABILITY OF GROUND CONDITIONS FOR CABLE BURIAL

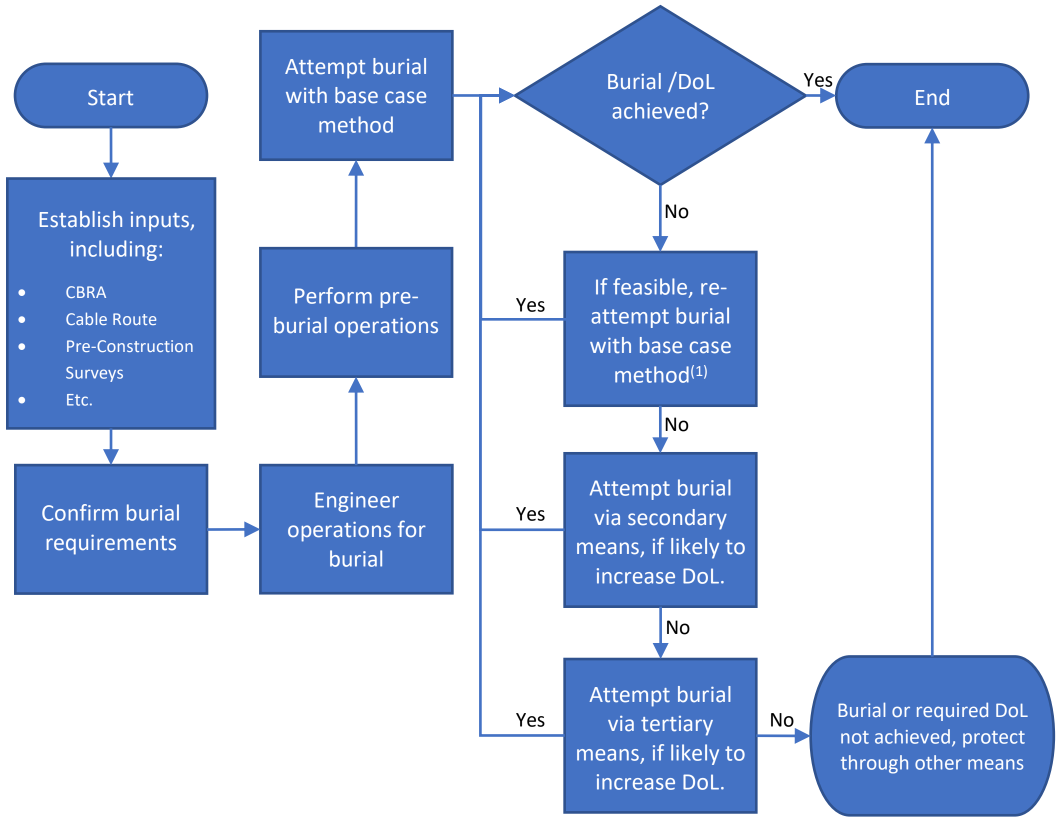
3.3.1 The available data on the ground conditions in the ECC in the M&LS SAC and CBRA work undertaken to date illustrates that the cable will be buried either into sand, sandy gravel or gravelly sand deposits or in the London clay that sits below these surficial sediments. Based on this information it is expected that it will be possible to effectively bury the cables in the M&LS SAC. However, it is not possible to completely rule out the potential need for cable protection if burial fails for any reason (e.g. due to equipment breakdown, or presence of unexpected boulders/ cobbles in the London clay that may hamper burial).

4 BURIAL HIERARCHY

4.1.1 The offshore export cable will be buried to protect it from damage caused by both the environment and other users of the sea. It is in VE's interest to ensure the export cable is appropriately protected to guarantee the export of power produced by the offshore windfarm. Burial feasibility is dependent primarily on the cable design and soil conditions along the cable route and the required depth is typically determined using a CBRA and the plan finalised in the Cable Specification and Installation Plan (CSIP), which will also include contingency options for burial. The outline CBRA (Volume 9, Report 9) and outline CSIP (Volume 9, Report 12) have been provided with the DCO application.

4.1.2 The flow chart (Figure 4.1) below provides an overview of the process that will be followed to ensure that cable protection is the last form of cable protection that will be considered when all other options have been exhausted.

4.1.3 Typical primary means of cable burial is use of a subsea trenching plough. This can be used in combination with a jetting lance and chain cutters that are attached to the subsea trencher. Typical secondary and tertiary methods of burial are jetting and cutting using separate, dedicated equipment for this purpose. The selection of the appropriate equipment will be done during the detailed design phase of the development and based on the design of the cable, the required depth of burial and the predominant soil structure along the export cable route.



(1) If simultaneous lay and burial is selected retrying burial with the same equipment may not be possible.

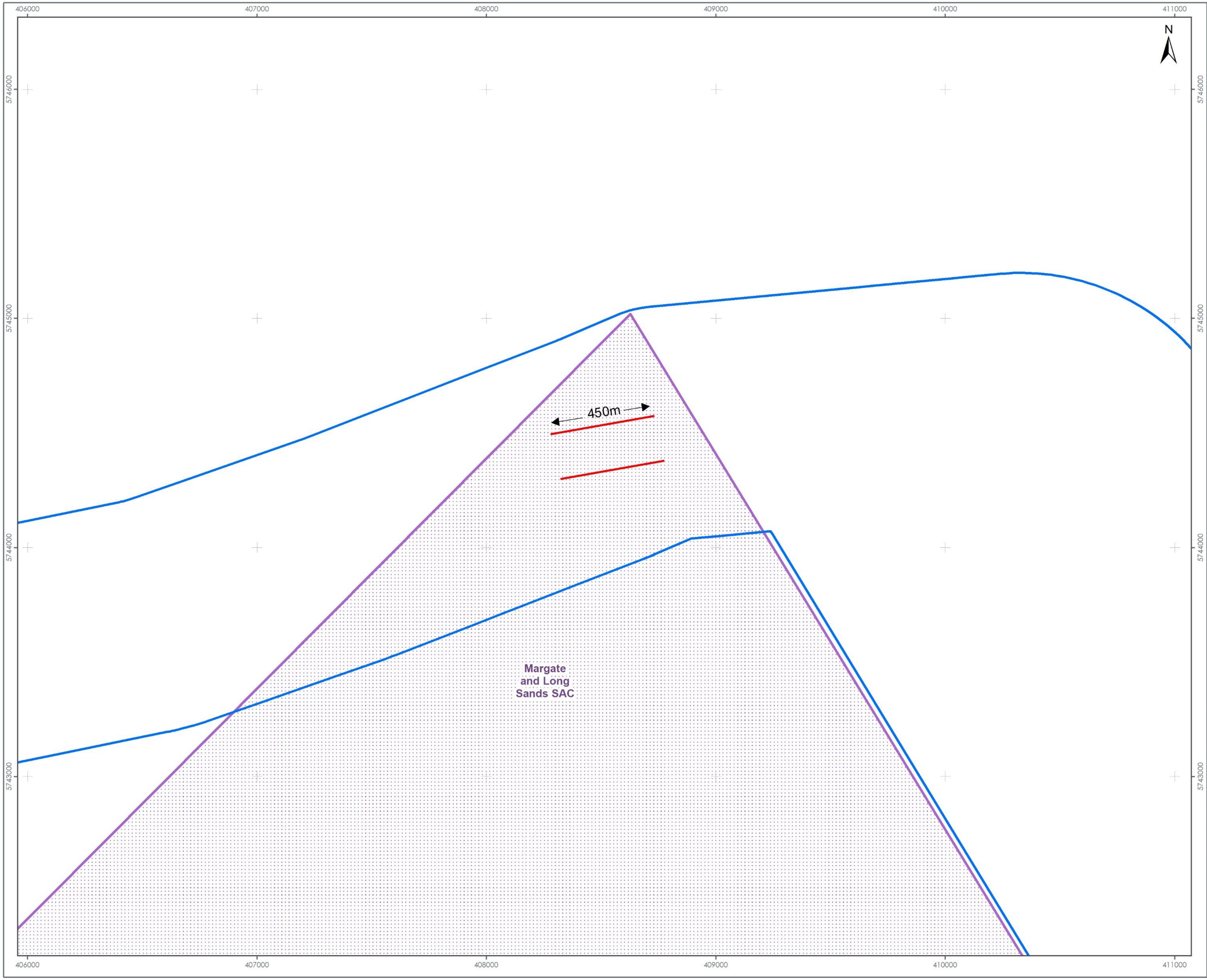
Figure 4.1 Flow chart to show cable protection

5 MAXIMUM LENGTH OF CABLE PROTECTION IN M&LS SAC

5.1.1 To refine the MDS for cable protection in the M&LS SAC, the ground conditions and seabed obstructions/anomalies have been assessed, along with the feasible route alignments across the offshore ECC. The cables could be routed anywhere in the offshore ECC and this flexibility will need to be maintained until geotechnical data is secured and detailed route engineering and burial assessment is undertaken pre-construction, by the cable installation contractor.

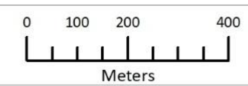
5.1.2 The shortest route option would run across the northern extent of the offshore ECC. The location of the final routes in this area will be informed by necessary separation from the North Falls cables which will be located directly north of the VE offshore ECC. However, feedback from Harwich Haven Authority has indicated that the cables should be installed at least 1 km south of the pilot boarding area to avoid creating additional risks for pilot boarding activities which would push the cables into the central area of the offshore ECC.

5.1.3 Based on the ground conditions, and variations in potential final route lengths through the M&LS SAC, a total length of 900 m of cable protection in the SAC has been assumed as the realistic MDS. Figure 6.1 below shows an indicative example of the length of cable protection within the SAC and outside the SAC for further context. The 900 m of cable protection has been split equally, but in reality, it could be a combination of lengths up to 900 m and the location of the cables could be anywhere within the offshore ECC corridor.



LEGEND

- Offshore Export Cable Corridor
- Special Areas of Conservation
- Indicative 900m cable protection extent within the SAC



Data Source:

PROJECT TITLE:

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DRAWING TITLE: Example of indicative cable protection length within the Margate and Long Sands SAC

VER	DATE	REMARKS	Drawn	Checked
1	04/03/2024	For Information	BPHB	AdB

DRAWING NUMBER: 5.1

SCALE: 1:15,000	PLOT SIZE: A3	DATUM: WGS84	PROJECTION: UTM31N

FIVE ESTUARIES
OFFSHORE WIND FARM

7 SUMMARY OF CABLE PROTECTION OPTIONS

7.1.1 To reduce the footprint of impact and mitigate for impacts as far as reasonably practicable, VE has considered the range of cable protection measures available, their suitability for use in the location and readiness of the technology. A summary of currently available alternatives along with those known to be under development in the industry is provided in Table 7.1 below.

Table 7.1 A summary of cable protection options

Item	Description	Benefits	Concerns	Environmental Impact
Rock Dump	Utilisation of specialist rock dump vessel to install quarried rock from onshore over the cable.	Well established method with strong track record. Simple and robust, historically this is the default protection option for unburied cables.	Difficult to remove without dredging.	Large footprint for required protection.
Concrete Mattress	Moulded concrete mattresses held together typically using poly-propylene ropes.	Well established method with strong track record. Simple material and flexibility in design allows for mattresses to be used in the majority of protection circumstances.	Difficult to remove due to possible degradation of polypropylene.	Smaller footprint than rock dump.
Rock Bags	Similar in principle to rock dump but using polypropylene net bags to discretely deploy the rock.	Well established method with strong track record. Typically used in more localised protection than rock dump.	Proving over trawlabiltiy can be challenging.	Similar footprint to mattresses.
Grout/ Sand Bags	Simple sand or grout bags bulk deployed over area requiring protection, similar to rock dump approach.	Simple and easy to deploy.	Higher cost than other methods, more difficulty to handle smaller items. Proving over trawlability can be challenging.	Similar footprint to mattresses. Significant quantities of cement required.

8 CABLE PROTECTION MITIGATION COMMITMENTS

8.1.1 Based on the information above it is evident that at the time of construction it may be possible to further reduce the footprint of impact using a form of cable protection that mitigates for effects on M&LS SAC. However, it is also evident that technology continues to evolve. Therefore, VE commit to the following in relation to preparations for cable installation:

- The area of cable protection in the SAC will not exceed 5,400 m^2;
- Final cable routing will seek to take the shortest route through the M&LS SAC where possible, and considering the required separation to North Falls cables and from the pilot boarding area – this routing work will also consider the potential for successful cable burial with the objective of avoiding the need for cable protection using the cable burial hierarchy set out above;
- Should burial not be achieved at the first attempt the burial hierarchy principles will followed in line with Section 4;
- Rock dumping using loose rock will not be considered a feasible protection in the M&LS SAC; and
- Should additional protection be required then mattresses or another form of protection that is equivalent or less in terms of footprint or impact will be used. Cable protection selection will also take into account the ability to remove the protection at the end of the life of the cables.

9 ECOLOGICAL BENEFIT OF MITIGATION COMMITMENTS

9.1.1 This section describes the ecological benefit of each of the mitigation commitments that are proposed (as set out in Section 7).

Table 9.1: Ecological benefits of mitigation commitments.

Mitigation Commitment	Ecological Benefit
The area of cable protection in the SAC will not exceed 5,400m^2.	The area of cable protection will not exceed this area in order to limit the spatial extent of cable protection and thus minimise its ecological impact.
Final cable routing will seek to take the shortest route through the M&LS SAC where possible, and considering the required separation to North Falls cables and from the pilot boarding area – this routing work will also consider the potential for successful cable burial with the objective of avoiding the need for cable protection using the cable burial hierarchy set out above.	By minimising the length of cable within the M&LS SAC where possible, the potential for it to affect the SAC will be minimised and thus ecological impacts reduced. However, it will also be of ecological benefit to take into consideration the potential for successful cable burial. This is because the burial of cable has fewer ecological implications than using cable protection.
Should burial not be achieved at the first attempt the burial hierarchy principles will be followed in line with Section 5.	Implementation of the burial hierarchy means that cable protection will only be used where efforts for burial have been exhausted. This offers ecological benefits because cable burial generally has fewer ecological impacts than cable protection. Although burial will lead to disturbance of sediments and may require pre-clearance activities such as sandwave clearance, overall burial should allow recovery of the sediment and associated fauna within a relatively short timescale (less than a year[1])
Rock dumping using loose rock will not be considered a feasible protection in the M&LS SAC.	Rock dumping is very difficult to remove upon decommissioning. It is therefore of ecological benefit to install other types of cable protection, such as mattresses, which can be removed upon decommissioning. Furthermore, rock dumping has a greater spatial footprint than other cable protection methods so it is of ecological benefit to avoid its use across sensitive habitats.

[1] https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010080/EN010080-001240-Natural%20England%20-%20Offshore%20Cabling%20paper%20July%202018.pdf

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